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(54) CLOTHES-DRYING OR AIRING APPARATUS

(71) I, BACON LIU, a citizen of the Republic of China, residing at 32-1, Lane 71, Hang Chou South Road, Section 1, Taipei, Taiwan, Republic of China, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a clothes-drying or airing apparatus.

A problem with existing clothes-lines is that clothes or articles which have been hung out to dry are frequently soaked again by rain when they are almost dry.

The present invention aims to overcome this problem by providing a clothes-drying or airing apparatus having means for either manually or automatically drawing an elongate member together with clothes or articles hung thereon to a position where the articles are not exposed to rain and draw the same to a position where they can be exposed in the sun or to the open air when rain ceases.

According to the invention there is provided a clothes-drying or airing apparatus comprising a mounting member adapted to be fixedly mounted on a part of a building structure, a support member including a sleeve portion mounted on a cylindrical portion of said mounting member and a pair of depending bifurcated brackets spaced from said sleeve portion, and an elongate member for supporting clothes to be dryed or aired, including a handle, slidably supported in said bifurcated brackets, whereby said elongate member may be moved between an extended position to project outside said building structure and a retracted position within said building structure.

The present invention further provides a clothes-drying or airing apparatus comprising a mounting member adapted to be fixedly mounted on a part of a building structure, an elongate member for supporting clothes to be dried or aired slidably supported on said mounting member for movement between an extended position to project outside said building structure and a retracted position within said building structure, and automatic drive means for said movement of the elongate member including a reversible electric motor, moisture sensing means and a control circuit arranged to drive said motor to retract the elongate member on detection of moisture by said sensing means and to extend the elongate member in the absence of detection of moisture by said sensing means.

The foregoing and other features and advantages of this invention will be more apparent from the following detailed description of certain preferred embodiments of this invention with reference to the accompanying drawings, in which:

Fig. 1 shows one embodiment of a clothes-drying apparatus according to the present invention in side elevation;

Fig. 2 is a sectional view taken along the line I—I of Fig. 1;

Fig. 3 is a sectional view taken along the line II—II of Fig. 1;

Fig. 4 shows another embodiment of a clothes-drying apparatus according to the present invention, in which an automatic control drive mechanism is provided for automatic operation;

Fig. 5 is a section taken along the line III—III of Fig. 4;

Fig. 6 is a scheme of toothed gearing relationship between the toothed wheel and the elongate member of the cothes-drying apparatus shown in Fig. 4;

Fig. 7 shows the actuator used in the apparatus of Fig. 4, partly cut away;

Fig. 8 is a plan view of a printed circuit board used in the moisture sensor means of the clothes-drying apparatus according to the present invention;

Fig. 9 is a side view of the moisture sensor means, illustrating the printed circuit board is mounted on an inclined plane of the sensor means; and

Fig. 10 is a circuit diagram of one embodiment of a control circuit for use in the clothes-drying apparatus of Fig. 4 according to the present invention.

Reference is now made to the drawings for a better understanding of this invention, wherein similar reference characters designate corresponding parts throughout the several views. Fig. 1 shows one embodi-

ment of the clothes-drying apparatus according to this invention; as is evident in Fig. 1, the clothes-drying apparatus comprises a mounting member 1, a support member 2, a cylindrical portion of the mounting member 3, an elongate member 4 and a handle 5. The mounting member 1 is adapted to be mounted on the ceiling or the wall of a building by means of screw bolts 61 or the like, and has a socket for connecting one end of the cylindrical portion 3. The support member 2 includes a sleeve portion 21, and a pair of supporting arms 22 and 23 horizontally extending in opposite direction from the sleeve portion 21; the outmost ends of the supporting arms are provided with depending bifurcated brackets 221 and 231 respectively, and reinforcements 24 and 25 are provided on both sides of the sleeve portion 21 and affixed to the supporting arms 22 and 23, as shown in Fig. 1. Preferably, the reinforcements 24 and 25, the supporting arms 22 and 23, and the sleeve portion 21 are integrally formed. The cylindrical portion 3 has one end received in the socket of the mounting member 1 and secured thereto with screw bolts 11 or the like, and the other end thereof extends through the sleeve portion 21 and has an end plate 31 for preventing the support member 2 from slipping-off therefrom. The support member 2 is rotatable with respect to the cylindrical portion 3, and a set of retainer means 211 is provided for selectively fixing the rotatable support member 2 in any one of the predetermined angular positions. The retainer means 211, as best seen in Fig. 2, includes a steel ball, a biasing spring and an adjustment screw, all of them are located in a threaded hole 212 extending through the wall of the sleeve portion 21, such that the steel ball is biased against one of the holes, which have a diameter smaller than that of the steel ball and are circumferentially spaced apart on the cylindrical portion 3, to hold the support member 2 in any one of the predetermined angular positions.

The depending bifurcated brackets 221 and 231 of the support member 2 are provided with guide pulleys as best shown in Fig. 3, wherein a first pulley 222 with an axle 223 is supported by each of the depending brackets 221 and 231 and is capable of free rotation, and two second pulleys 224 and 225, capable of free rotation, are arranged so as to define a T-shaped gap existing between these guide pulleys 222, 224 and 225.

The elongate member 4 has a cross-section as shown by the reference numeral 4 of Fig. 2, the T-shaped portion thereof is adapted to extend through the T-shaped gaps defined by the guide pulleys mounted on the respective depending bifurcated brackets 221 and 231 of the supporting arms 22 and 23. The handle 5 is coupled to one end of the elongate member for manual operation, thereby the elongate member may be slid in either direction as desired. Of course, both ends of the elongate member 4 are provided with cushion stoppers 43 and 44, in order to define the limit of the sliding motion, a plurality of holes 41 on the elongate member 4 for hanging clothes or other articles are provided, and further, projection plates 42 are provided on one end of the elongate member 4 adjacent to the handle 5, as best seen in Fig. 1, in order to make snug contact with the end plate 31 and thus prevent the elongate member 4 from random rotation about the cylindrical member 3 when the elongate member 4 is slid to a position in the open air.

Fig. 4 illustrates another embodiment according to this invention, wherein, an automatic control drive mechanism is presented for automatic operation. Said automatic control drive mechanism comprises a toothed wheel 226, a reversible motor 7, a control circuit provided in a member 13, two microswitches 9 and 10, and a moisture sensor means 8. The toothed wheel 226 is mounted on the bracket 221 in place of the pulley 222 and is driven by the reversible motor 7. In this embodiment, the elongate member 4 is provided with a track of teeth along the full length of the T-shaped portion thereof for being in toothed gearing relationship with the toothed wheel 226, as clearly shown in Figs. 6 and 5, such that the elongate member 4 may be caused to travel as the toothed wheel 226 is driven by the motor 7, and the traveling direction is determined by the rotating direction of the motor. Microswitches 9 and 10 are respectively located at the outmost ends of the supporting arm 22 and 23, and have normally closed contacts, which are connected in the control circuit as will be apparent hereinafter and are opened to stop the motor 7 when the switches engage the respective abutments 11 and 12 on the elongate member 4. The actuators 11 and 12 are of the same construction as shown in Fig. 7 including an actuating bar 111 and a coil spring 112 for cushion effect, and are located at the respective ends of the elongate member 4 for urging the respective microswitch to change state upon its arrival at the microswitch, as shown in Fig. 4, wherein the elongate member 4 is caused to travel rightwards and the actuator 12 is shown to urge against the microswitch 10 to stop the motor 7. The moisture sensor means 8 is located in the open air and comprises a printed circuit board with a warming device, such as an electric heater which is used to dry the said sensor means. The top view of the printed circuit board is shown in Fig.

8 from which it will be seen that the printed circuit board contains two conductive regions 81 and 82. Said two regions are isolated from each other by an insulation 83. The isolating resistance is about 1 MΩ. In this embodiment of the present invention, the printed circuit board is arranged in series with a transistor and relay circuit of the control circuit as will be apparent hereinafter. Due to the large isolating resistance, the relay is normally in released condition, and the motor is normally not actuated. If rain falls and the sensor means 8 gets wet, the isolating resistance between the two regions 81 and 82 will be greatly reduced (to about 10Ω), and thus produces one electrical signal to operate the relay. The printed circuit board is preferably mounted in an inclined position, as shown in Fig. 9, to avoid water accumulating thereon and to influence the sensibility of the sensor means when rain ceases.

Now, the operation of the control circuit relating to the microswitches 9 and 10, the motor 7 and the sensor means 8 will be made apparent hereinafter with reference to Fig. 10, wherein the control circuit diagram is shown.

As shown in Fig. 10, the control circuit includes a relay R, said relay R is connected in series with the collector of transistor Q, of which the base is connected through a variable resistor VR to the moisture sensor means 8, and two contacts 9 and 10; the contacts 9 and 10 are the contacts of the respective microswitches 9 and 10 mentioned above, and are opened only if the corresponding microswitches are urged by the actuator 11 and 12 respectively. Now, suppose that the elongate member 4 is slid to a position not exposed to rain, i.e. the actuator 11 is urged against the microswitch 9 to make the contact thereof opened, while the microswitch 10 is normally closed, as shown in Fig. 10, and assume that there is no rain and the surface of the moisture sensor means 8 is in a dry state, the two regions 81 and 82 on the sensor board will be kept isolated by the insulation 83 disposed therebetween, and relay R does not operate. Therefore, a motor circuit is completed through the normal-close relay contact R_b and the contact of the microswitch 10, causing the motor 7 to start rotating in a direction and thus to drive the toothed wheel 226 such that the elongate member 4 is moved to the position in the open air until the actuator 12 is urged against the microswitch 10 to open the contact thereof. The motor circuit is then cut off and the motor stops rotation. It should be noted that while the elongate member 4 is travelling, the actuator 11 leaves the microswitch 9 and releases it, i.e. the contact 9 returns to its closed position.

Suppose rain falls and the sensor means 8 gets wet, then the isolating resistance between the two regions 81 and 82 will be greatly reduced and the current through the relay R largly increased, thereby causing the relay to operate to close the normal-open contact R_a and to open the contact R_b. A closed motor circuit is again completed through contact R_a and the contact of the microswitch 9. But this time, the motor is arranged to rotate in the reverse direction. Therefore, the elongate member together with the clothes hung thereon will be drawn back to the position not exposed to rain until the actuator 11 is urged against the microswitch 9 to make the contact thereof opened and stop the motor 7.

At the same time, the warming device H is connected in the circuit and generates heat to dry the sensor means 8. However, as long as rain falls or the sensor means 8 is moistened, the relay R will operate and keep the contact R_b opened. Although the contact 10 is now closed, motor circuit is still kept in cut-off condition.

As soon as rain stops, the raindrops on the sensor means 8 evaporate quickly due to the warming means. Then the isolating resistance between the two regions 81 and 82 is increased to about 1 MΩ, causing the relay R to release. Thus the contact R_b is closed and a motor circuit is completed. Upon this, the motor 7 will start again to drive the elongate member 4 in the direction in which the elongate member 4 together with the clothes or other articles hung thereon are slid out for sun-drying.

Though a full wave bridge rectifier is shown in Fig. 10, it is to be realized that a half wave rectifier can be also used.

It should also be noted that although a control circuit is shown and discussed heretofore, it is only one of the possible embodiments, and various changes or modifications may be made by those skilled in the art without departing from the scope of the invention as set forth in the following claims. For example, the relay may be replaced by an equivalent electronic switch such as a flip-flop. Moreover, the bi-polar transistor may be replaced by an equivalent element such as a vacuum tube or FET; or the circuitry may be implemented with IC components etc.

WHAT I CLAIM IS:—

1. A clothes-drying or airing apparatus comprising a mounting member adapted to be fixedly mounted on a part of a building structure, a support member including a sleeve portion mounted on a cylindrical portion of said mounting member and a pair of depending bifurcated brackets spaced from said sleeve portion, and an elongate member for supporting clothes to be dryed

or aired, including a handle, slidably supported in said bifurcated brackets, whereby said elongate member may be moved between an extended position to project outside said building structure and a retracted position within said building structure.

2. An apparatus as claimed in Claim 1, wherein said support member includes two arms each extending from said sleeve portion and supporting one of said bifurcated brackets at the end thereof remote from the sleeve portion.

3. An apparatus as claimed in Claims 1 or 2, wherein said sleeve portion of the support member is rotatably mounted on said cylindrical portion of the mounting member, and retaining means is provided on said sleeve portion whereby the support member may be releasably retained in selected angular positions about the cylindrical portion.

4. An apparatus as claimed in Claims 1, 2 or 3, wherein said elongate member includes a portion, of generally "T" shaped cross-section, and said depending bifurcated brackets are each provided with guide rollers which together define a corresponding "T" shaped aperture in which said portion of the elongate member is so slidably supported.

5. A clothes-drying or airing apparatus comprising a mounting member adapted to be fixedly mounted on a part of a building structure, an elongate member for supporting clothes to be dried or aired slidably supported on said mounting member for movement between an extended position to project outside said building structure and a retracted position within said building structure, and automatic drive means for said movement of the elongate member including a reversible electric motor, moisture sensing means and a control circuit arranged to drive said motor to retract the elongate member on detection of moisture by said sensing means and to extend the elongate member in the absence of detection of moisture by said sensing means.

6. A clothes-drying or airing apparatus comprising a mounting member adapted to be fixedly mounted on a part of a building structure, a support member including a sleeve portion mounted on a cylindrical portion of said mounting member and a pair of depending bifurcated brackets spaced from said sleeve portion, an elongate member for supporting clothes to be dried or aired slidably supported in said bifurcated brackets, whereby said elongate member may be moved between an extended position to project outside said building structure and a retracted position within said building structure, and automatic drive means for said movement of the elongate member including a reversible electric motor, moisture sensing means and a control circuit arranged to drive said motor to retract the elongate member on detection of moisture by said sensing means and to extend the elongate member in the absence of detection of moisture by said sensing means.

7. An apparatus as claimed in Claim 5 or 6, wherein said control circuit includes micro-switches disposed to be actuated by said elongate member and arranged to limit the travel thereof.

8. An apparatus as claimed in Claim 5, 6 or 7 wherein said motor drives said elongate member by means of a gear pinion arranged in engagement with a rack provided on the elongate member.

9. An apparatus as claimed in Claim 5, 6 or 7, wherein said moisture detecting means includes an electric heater and said control circuit includes means for energising that electric heater when moisture is detected by said sensing means.

10. A clothes-drying or airing apparatus substantially as herein described with reference to the accompanying drawings.

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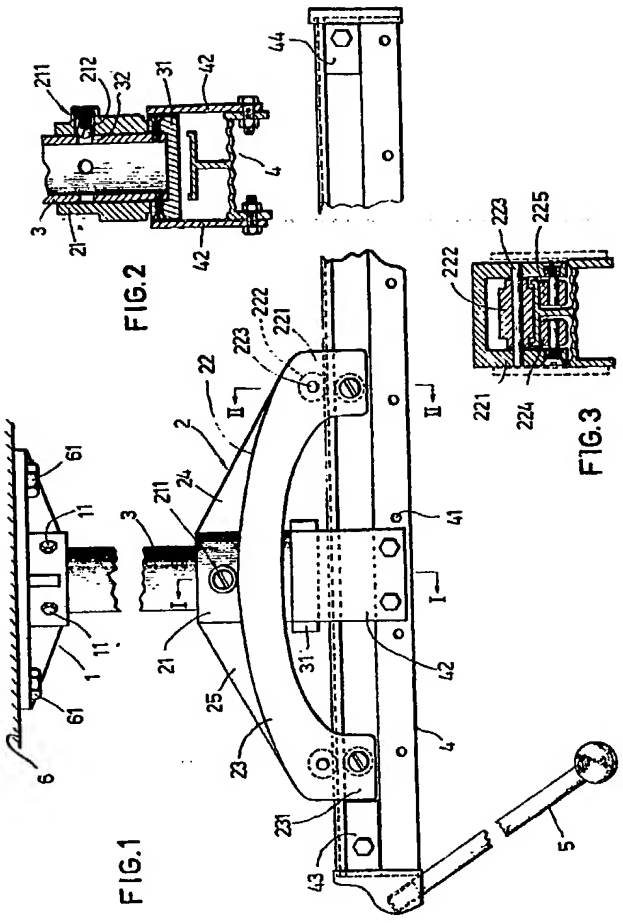
1466505 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1



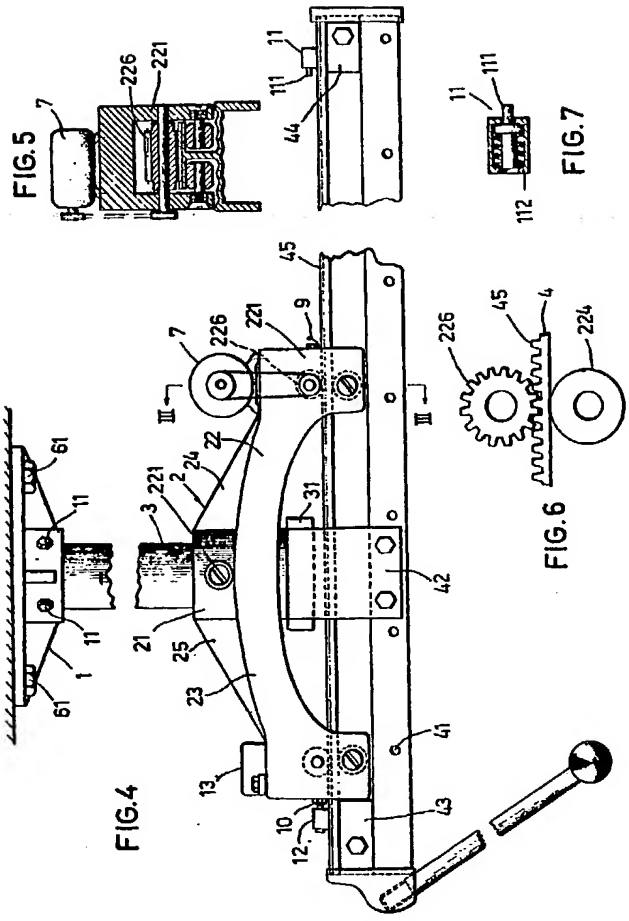


FIG.5
FIG.7
FIG.6
FIG.4
III
III

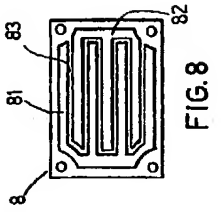


FIG.8

FIG.9

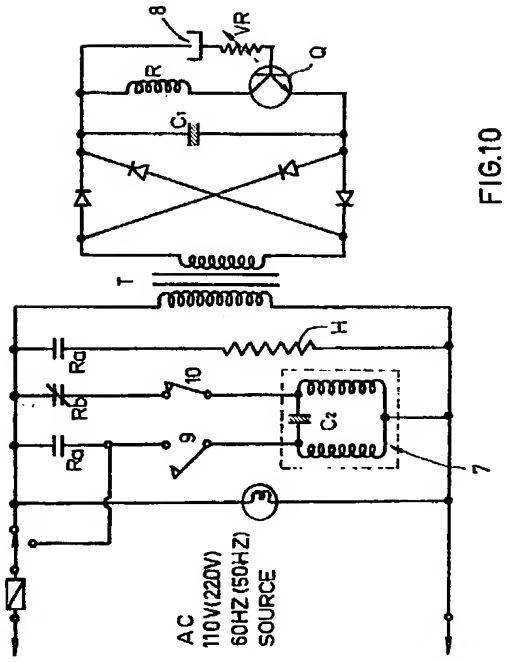


FIG.10